SECTION 2.3 - EVALUATING LIMITS

Find the limits in Exercises 1–56.

1. $\lim_{x \to 8} 7.$
2. $\lim_{x \to -\infty} (-3).$
3. $\lim_{x \to 0^+} \pi.$
4. $\lim_{x \to -2} 3x.$
5. $\lim_{y \to 3^+} 12y.$
6. $\lim_{h \to +\infty} (-2h).$
7. $\lim_{x \to 5} \sqrt{x^3 - 3x - 1}.$
8. $\lim_{x \to 0^-} (x^4 + 12x^3 - 17x + 2).$
9. $\lim_{y \to -1} (y^6 - 12y + 1).$
10. $\lim_{x \to 3} \dfrac{x^2 - 2x}{x + 1}.$
11. $\lim_{y \to 2^-} \dfrac{(y - 1)(y - 2)}{y + 1}.$
12. $\lim_{x \to 0} \dfrac{6x - 9}{x^3 - 12x + 3}.$
13. $\lim_{x \to 4} \dfrac{x^2 - 16}{x - 4}.$
14. $\lim_{t \to -2} \dfrac{t^3 + 8}{t + 2}.$
15. $\lim_{x \to 1^+} \dfrac{x^4 - 1}{x - 1}$
16. $\lim_{x \to 2} \dfrac{x^2 - 4x + 4}{x^2 + x - 6}.$
17. $\lim_{x \to -1} \dfrac{x^2 + 6x + 5}{x^2 - 3x - 4}$
18. $\lim_{t \to 1} \dfrac{t^3 + t^2 - 5t + 3}{t^3 - 3t + 2}.$
19. $\lim_{x \to +\infty} \dfrac{3x + 1}{2x - 5}.$
20. $\lim_{x \to +\infty} \dfrac{1}{x - 12}.$
21. $\lim_{y \to -\infty} \dfrac{3}{y + 4}.$
22. $\lim_{x \to +\infty} \dfrac{5x^2 + 7}{3x^2 - x}.$
23. $\lim_{x \to -\infty} \dfrac{x + 2}{x^2 + 2x + 1}.$
24. $\lim_{s \to +\infty} \sqrt[3]{\dfrac{3s^7 - 4s^5}{2s^7 + 1}}.$
25. $\lim_{x \to -\infty} \dfrac{\sqrt{5x^2 - 2}}{x + 3}.$
26. $\lim_{x \to +\infty} \dfrac{\sqrt{5x^2 - 2}}{x + 3}.$
27. $\lim_{y \to -\infty} \dfrac{2 - y}{\sqrt{7 + 6y^2}}.$
28. $\lim_{y \to +\infty} \dfrac{2 - y}{\sqrt{7 + 6y^2}}.$
29. $\lim_{x \to -\infty} \dfrac{\sqrt{3x^4 + x}}{x^2 - 8}$
30. $\lim_{x \to +\infty} \dfrac{\sqrt{3x^4 + x}}{x^2 - 8}.$
31. $\lim_{x \to 3^+} \dfrac{x}{x - 3}.$
32. $\lim_{x \to 3^-} \dfrac{x}{x - 3}.$
33. $\lim_{x \to 3} \dfrac{x}{x - 3}.$
34. $\lim_{x \to 2^+} \dfrac{x}{x^2 - 4}.$
35. $\lim_{x \to 2^-} \dfrac{x}{x^2 - 4}.$
36. $\lim_{x \to 2} \dfrac{x}{x^2 - 4}.$
37. $\lim_{y \to 6^+} \dfrac{y + 6}{y^2 - 36}.$
38. $\lim_{y \to 6^-} \dfrac{y + 6}{y^2 - 36}.$
39. $\lim_{y \to 6} \dfrac{y + 6}{y^2 - 36}.$
40. $\lim_{x \to 4^+} \dfrac{3 - x}{x^2 - 2x - 8}.$
41. $\lim_{x \to 4^-} \dfrac{3 - x}{x^2 - 2x - 8}.$
42. $\lim_{x \to 4} \dfrac{3 - x}{x^2 - 2x - 8}.$
43. $\lim_{x \to +\infty} \dfrac{7 - 6x^5}{x + 3}.$
44. $\lim_{t \to -\infty} \dfrac{5 - 2t^3}{t^2 + 1}.$
45. $\lim_{t \to +\infty} \dfrac{6 - t^3}{7t^3 + 3}.$
46. $\lim_{x \to 0^+} \dfrac{x}{|x|}.$
47. $\lim_{x \to 0^-} \dfrac{x}{|x|}$
48. $\lim_{x \to 3^-} \dfrac{1}{|x - 3|}.$
49. $\lim_{x \to 9} \dfrac{x - 9}{\sqrt{x} - 3}.$
50. $\lim_{y \to 4} \dfrac{4 - y}{2 - \sqrt{y}}.$
51. $\lim_{x \to +\infty} \sqrt{x}.$
52. $\lim_{x \to -\infty} \sqrt{5 - x}.$
53. $\lim_{x \to -\infty} (3 - x).$
54. $\lim_{x \to -\infty} (3 - x^2).$
55. $\lim_{x \to +\infty} (1 + 2x - 3x^5).$
56. $\lim_{x \to +\infty} (2x^3 - 100x + 5).$
57. Find
$$\lim_{x \to a} \frac{x}{x + a}$$
where a is an arbitrary constant. [*Hint:* Consider the cases, $a \neq 0$ and $a = 0$ separately.]
58. Let $f(x) = \dfrac{x^3 - 1}{x - 1}$.
    (a) Find $\lim_{x \to 1} f(x)$
    (b) Sketch the graph of $y = f(x)$.
59. Let
$$f(x) = \begin{cases} x - 1, & x \leq 3 \\ 3x - 7, & x > 3 \end{cases}$$
Find
    (a) $\lim_{x \to 3^-} f(x)$ (b) $\lim_{x \to 3^+} f(x)$
    (c) $\lim_{x \to 3} f(x)$.